Altai Outdoor Wi-Fi Network for Rural Application

Internet access at city urban areas is more easily available because of the relatively high population density. Internet Service Operator (ISP) can provide Internet service to commercial and residential buildings easily by laying a fiber backbone to the buildings. However, in rural areas where the population density is low, the housing distribution is scattered and the cost of laying long fibre is ineffective, not to mention that Internet service is not available and telephone service is very limited.

1. The Problem

Those ISP encountered the following problems when they planned to deploy Internet service to household in rural areas:

- **Lack of cable/ fibre to households** – traditional way to deploy Internet service speedily is to employ xDSL technology. However, in real deployment to some older city rural areas, those ISPs found that the quality of telephone cables is poor enough and sometimes Internet service is difficult to be realized, if not impossible, by using xDSL.

- **Congested block wiring in old buildings** – an alternative method is to lay Unshielded Twisted Pair (UTP) cables and Ethernet switches. However, many old buildings have their block wiring duct (vertical duct running along the building for all communication cables) congested with different kinds of cable already; which made addition of new cables extremely difficult to proceed. Further, fire safety regulatory may require another approval test conducted before the services can be provisioned. All the above made provisioning difficult and time-consuming. A few months or more is common.

- **Sparsely distributed houses** – even if technical issues of the above can be resolved, another question is whether it is cost-effective or profitable in provisioning for a particular residential customer if the aggregated customer base in that area is low. In many rural areas in the world, the houses are just one or two floors and scattered sparsely across a large residential area. No ISP is willing to lay copper or fiber cables to these regions because investment is not justifiable, and that is why still a lot of places in the world are lack of communication.

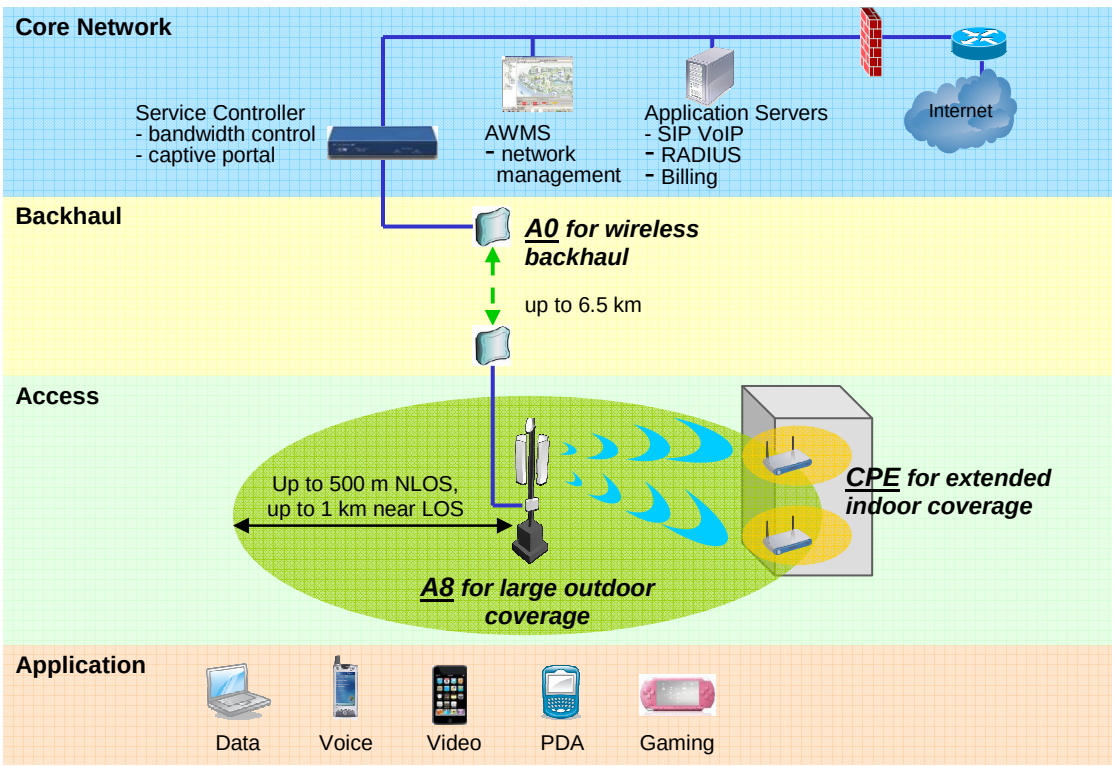
- **High costs in laying fiber** –the cost of laying optical fibre is not justifiable for low density rural areas at normal subscription fee. However, to increase in subscription fee is not workable as this will exceed the affordability of normal residents.

- **High costs in using mesh AP network** – those ISPs who have deployed mesh wireless network before found that the solution was unsatisfactory. The major problem is the small coverage capability of just 90 m to 150 m per access point (AP), which means a large number of installation sites are required. Another problem is very low throughput and large time delay in deploying voice service, due to extensive hopping in network design in order to save for the Internet backhaul.

2. The Altai Solution

Altai won many successful rural application cases, when wired local loop method was completely not justified. A typical network solution is shown below:

Typical Rural Network Architectural Diagram



- **Primary coverage** – ***Altai A8 WiFi Cellular Base Station*** will be used for primary coverage over large area. The coverage distance varies with the rural environment and

building structures. For low-raised buildings scenario, a 350 to 500 m NLOS distance is achievable and only 2 to 4 A8 base stations are required for each km. For open areas such as parks or highways, a near line-of-sight of up to 1 km can be reached.

- **Backhaul and termination point** – usually at the rural centre, wired Internet outlet can be available; A8 can be connected to these outlets. At areas further away from the rural centre, ***Altai A0 WiFi Bridge*** will be used to extend backhaul wirelessly for up to 6.5 km.

- **Indoor coverage** – for larger houses with deep interior areas, ***Dual Zone Indoor CPE*** will be installed at inner window sides of buildings to extend outdoor 802.11b/g signal from A8 to 802.11b/g indoor.

- **Network and client management** – ***Altai WiFi Management System (AWMS)*** will be used for full configuration, fault, security, performance, wireless link and client management with multiple languages, GUI and GPS network map support. Optional Service Controller is available for per household bandwidth control and captive portal access control.

3. The Altai Advantage

- **65% saving in CAPEX and OPEX** – with a much lower quantity of radio per area, Altai WiFi networking products can save your costs not only in hardware, but also in site buildup, installation, maintenance and operation, resulting in saving in total cost of ownership of as high as 65%!

- **Long range capability** – by using ***multiple radios and multiple smart antennas technology***, extra antenna array gain, diversity gain and special gain from signal processing technique can be attained. A 3X increase in distance or 7X increase in area coverage can be achieved. A long range of up to 1000 m near LOS or 500 m NLOS distance can be provided by A8.

- **High throughput for more subscribers** – by using ***cellular backhaul architecture*** similar to those of GSM or CDMA base stations, dedicated backhaul of 20 Mbps can be assigned to each A8, ensuring the highest bandwidth possible for each user. A cluster bandwidth of as high as 80 Mbps can be provided. As a rule-of-thumb, each A8 can support 100 subscribers each with 1 to 2 Mbps data throughput.

- **Complete voice and Internet services for household** – the use of CPE will not only provide extended indoor coverage, it also provides RJ-11 and RJ-45 outlets for connection to analog telephone and desktop PC. Its wireless access interface provides also wireless connection to SIP phone and laptop. Altogether, the Altai rural network solution provides voice and Internet services in both wired and wirelessly connection to household without the needs for any outdoor cabling.

- **Fast deployment in days** – each of the 4 sector antennas can be installed at different positions horizontally or vertically, and each of which can be adjusted in orientation and down-tilted angle, allowing different target distances and cell shapes. This is particularly useful in different household distribution environment. The powerful coverage capability can greatly reduce the number of mounting locations, which may not be easily available in rural areas.

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